

PHOTOVOLTAIC INVERTER FOR GRID CONNECTION



EQUINOX

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1. Introduction

1.1. Gratefulness letter

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully before starting up the equipment and keep it for any possible future consult that can arise.

We remain at your entire disposal for any further information or any query you should wish to make

Yours sincerely.

SALICRU

- ☐ The equipment here described can cause important physical damages due to wrong handling. This is why, the installation, maintenance and/or fixing of the here described equipment must be done by our staff for specifically authorised.
- ☐ According to our policy of constant evolution, we reserve the right to modify the specifications in part or in whole without forewarning.
- ☐ All reproduction or third party concession of this manual is prohibited without the previous written authorization of our firm.

1.2. Using this manual

The purpose of this manual is to give explanations and procedures for the installation and operating of the equipment. This manual has to be read carefully before installing and operating it. Keep this manual for future consults.

1.2.1. Conventions and used symbols



ures.

«**Warning**» symbol. Carefully read the indicated paragraph and take the stated prevention measures.



Manual.

«**Danger of electrical discharge**» symbol. Pay special attention to it, both in the indication on the equipment and in the paragraph referred to this user's Manual.



this terminal.

«**Main protective earthing terminal**» symbol. Connect the earth cable coming from the installation to this terminal.



«**Notes of information**» symbol. Additional topics that complement the basic procedures.



Preservation of the environment: The presence of this symbol in the product or in their associated documentation states that, when its useful life is expired, it will not be disposed together with the domestic residuals. In order to avoid possible damages to the environment, separate this product from other residuals and recycle it suitably. The users can contact with their provider or with the pertinent local authorities to be informed on how and where they can take the product to be recycled and/or disposed correctly.

1.2.2. For more information and/or help

For more information and/or help of the version of your specific unit, request it to our Service and Technical Support (S.T.S.).

2. Quality and Standard guarantee

2.1. Management declaration

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001:2000** and **ISO 14001:2004** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, through:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

2.2. Standard

The EQUINOX product is designed, manufactured and commercialized in accordance with the standard EN ISO 9001 of Quality Assurance. The **CE** marking shows the conformity to the EEC Directive (quoted between brackets) by means of the application of the following standards

- **2006/95/EC** of Low Voltage Safety.
- **2004/108/EC** of Electromagnetic Compatibility (EMC).
in accordance with the harmonized standards.
Reference regulations:
- **EMC:** DIN EN 61000-6-3 (2007) and DIN EN 61000-6-2 (2005).
- **Regulation of grid perturbations:** RD1699.
- **Low voltage:** DIN EN 50178 (4.98) (VDE 0160) (IEC62103).



The declaration of conformity **CE** of the product is at the disposal of the client previous express request to our head offices.

2.3. Environment

This product has been designed to respect the environment and has been manufactured in accordance with the standard ISO 14001.

Recycling the equipment at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the recovered product at the end of its useful life (contact your distributor).

Packaging: To recycle the packing, follow the legal regulations in force.

3. Presentation

3.1. Introduction of photovoltaic system with connection to electrical grid

Photovoltaic system with connection to grid is principally based on 4 parts: photovoltaic panels, photovoltaic inverter, junction box to AC grid (Connection interface) and connection to public grid.

When a photovoltaic panel is exposed to sunlight and connected to an inverter, it creates DC power. The inverter makes the DC/AC conversion and supplies the electrical grid through the AC junction box.

Next figure shows the inverter in a photovoltaic system with connection to grid.

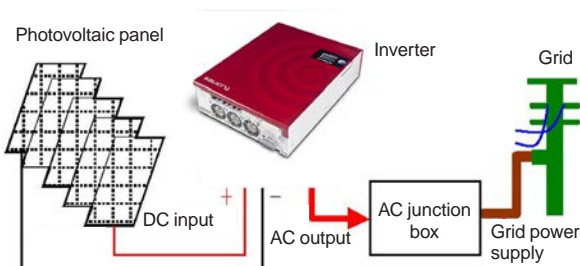


Fig. 1. Typical diagram of a photovoltaic system connection

- **Photovoltaic panel:** It supplies the direct current power (DC) to the inverter.
- **SALICRU photovoltaic inverter:** It converts the DC voltage coming from the photovoltaic panels into AC voltage. Due to its connection to the grid, it will manage the current amplitude according to the power supplied by the photovoltaic panels, extracting always the maximum power.
- **AC junction box.** This interface between the grid and the inverter is based on a circuit breaker, fuse and connection terminals. To meet the local regulations, standards and codes, the system has to be designed and installed by a qualified technician.
- **Grid:** It is the network through the electrical energy is distributed by the **electrical energy company**. SALICRU inverters can only be connected to low voltage systems (230V, 50Hz.).

3.2. Introduction to EQUINOX inverter

EQUINOX inverter with connection to grid, converts the direct current (DC) created by the photovoltaic panels to alternating current (AC), which is compatible with the local electrical distribution grid.

3.3. Range

Range of powers are made up by:

- **EQX-2800:** 2,8 kW single phase for indoor installation.
- **EQX-3450:** 3,45 kW single phase for outdoor installation.
- **EQX-3680:** 3,68 kW single phase for outdoor installation.
- **EQX-4000:** 4,0 kW single phase for outdoor installation.
- **EQX-5000:** 5,0 kW single phase for outdoor installation.
- **EQX-10000:** 10,0 kW three phase for outdoor installation.

3.4. Constituent parts

Next, description of main parts of **EQUINOX** inverter are stated:

3.4.1. EQX-10000

(1) 3 pair of DC input terminals

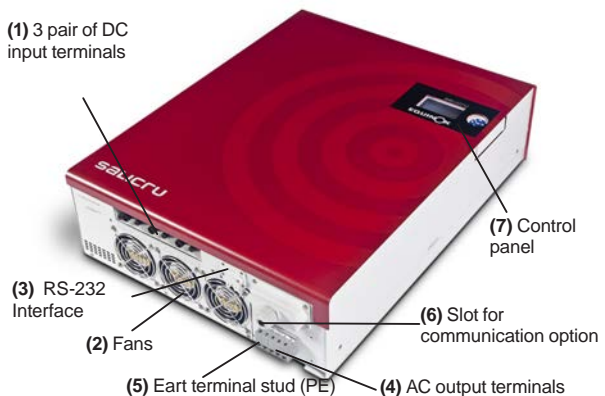


Fig. 2. View of constituent parts EQX-10000

- (1) **3 pair of independent DC input terminals (3 MPPT):** Each pair of input terminals are made up by positive and negative terminals. See Installation chapter for more details.
- (2) **Fans:** Inverter is equipped with 3 fans to exhaust all the heat inside. When the heatsink temperature reaches 50°C, fans are activated automatically.
- (3) **RS-232 Interface:** Connect this interface to PC directly through the RS-232 serial cable.
- (4) **AC output terminals:** L1 (Line 1), L2 (Line 2), L3 (Line 3), N (Neutral), Grd (PE): \varnothing 6mm².
- (5) **Protection Earth terminal (PE):** See Installation chapter for more information. G (Earth, PE): \varnothing 10mm².

(6) **Slot for communication option:** It is for RS-485 card, communication interface option.

(7) **Control panel:** This device shows and logs all the useful information about the inverter operating, like the status and warning messages. Furthermore, as it is joined with a 1,8m. cable, it can be removed from its slot and be located wherever. In case were needed to extend its length, use a RS-232 (DB9) communication cable up to 15 metres.

3.4.1.1. Graphic data logger (Control panel)



Fig. 3. View of remote control panel

SETTING.

Next table shows the main features of control panel.

LCD	Monochrome
Information to display	Input power, output power, operating mode and warning message.
Storage duration	3 months
Storage means	SD card
Data download	USB cable type A to mini-B

FEATURES.

Removable control panel: Data logger can be easily removed and located back again into the main unit. This way, it can be hanged in the wall separate from the inverter.

Colour backlight: Backlight of LCD panel changes its colour depending on the inverter status:

- **Green:** Start and normal operating.
- **Red:** Grid or system fault (see “table of error messages”). Inverter is disconnected from grid and backlight of LCD panel changes to red during its disconnection.
- **Yellow:** After disconnecting, the inverter recover its status of normal operating. LCD panel changes to yellow for 48 hours.

Data download: It is possible to download and access to data logger for managing the internal data through a PC via USB cable. For more information, see “Download of internal data to data logger” chapter.

CONNECTION.

Control panel can be left assembled in the inverter or removed, to be hanged on the wall, connected through the cable quoted previously.

APPERANCE.

- LCD: 128 x 64 mm., monochrome.
- Keypad: “↑”, “↓”, “→”, “←” and “OK” in the centre.



- Backlight: 3 colours.



3.4.1.2. Quality performances.

- Lead free, in accordance with RoHS (Restriction of dangerous substances).
- High conversion efficiency 97%.
- 3 trackers of MPP (Maximum Power Point).
- Protection degree IP65.
- Graphic display 128x64 mm.
- 3 phases, 4 cables, 400V.
- Compact design.
- High reliability.
- User friendly operating.
- Maintenance free.
- Powerful communication interface.
- Integrated ENS, in accordance with VDE 0126-1-1.
- Earth fault detector of 30 mA. already integrated.

3.4.2. EQX-5000

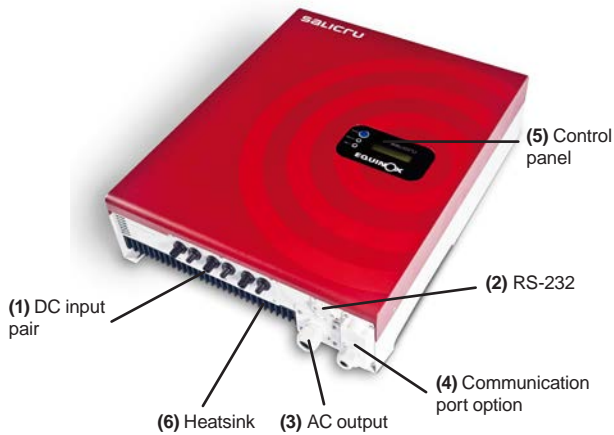


Fig. 4. View of EQX-5000 constituent parts

- (1) **3 pair of DC input terminals:** Each pair of input terminals are made up by positive and negative terminals. See Installation chapter for more details.
- (2) **RS-232 Interface:** Connect this port to PC directly through the RS-232 serial cable.
- (3) **AC output:** It supplies AC voltage to grid.
- (4) **Slot for communication option:** It is for RS-485 card, communication interface option.
- (5) **Control panel:** It is based on LCD panel to show the status of the inverter.
- (6) **Heatsink.**

3.4.3. EQX-4000 / 3680 / 3450

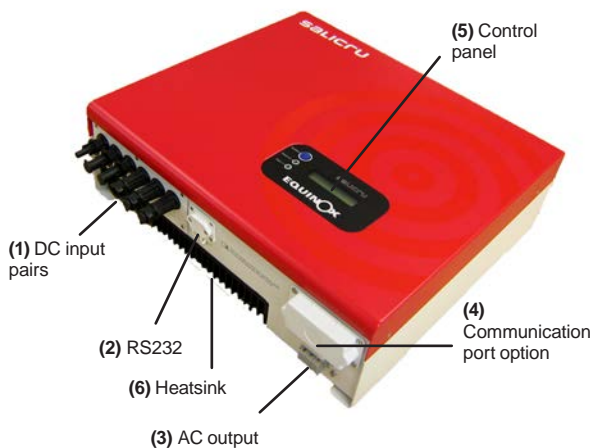


Fig. 5. View of EQX-4000 constituent parts

- (1) **3 pair of DC input terminals:** Each pair of input terminals are made up by positive and negative terminals. See Installation chapter for more details.
- (2) **RS-232 Interface:** Connect this port to PC directly through the RS-232 serial cable.
- (3) **AC output:** It supplies AC voltage to grid.
- (4) **Slot for communication option:** It is for RS-485 card, communication interface option.
- (5) **Control panel:** It is based on LCD panel to show status of the inverter.
- (6) **Heatsink.**

3.4.4. EQX-2800

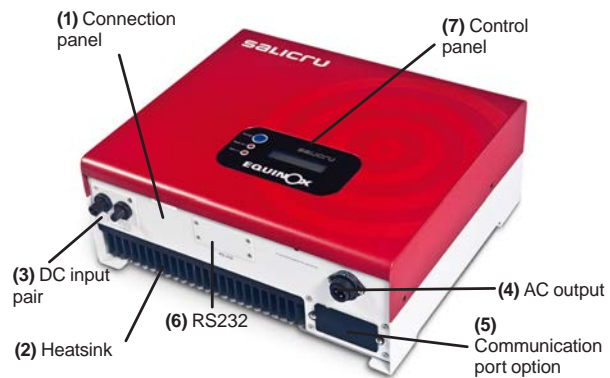


Fig. 6. View of EQX-2800 constituent parts

- (1) **Connection panel:** It has the DC and AC terminals AC and communication ports.
- (2) **Heatsink.**
- (3) **Pair of DC input terminals:** This pair of input terminals is made up by positive and negative terminals. See Installation chapter for more details.
- (4) **AC output:** It supplies AC voltage to grid.
- (5) **Slot for communication option:** It is an optional port for extended communication interface. For example, for RS-485 card. It is protected by a sealed cover.
- (6) **RS-232 Interface:** Connect this port to PC directly through the RS-232 serial cable.
- (7) **Control panel:** It is based on LCD panel to show status of the inverter.

3.4.5. Quality performances for EQX-5000 / 4000 / 3680 / 3450 and 2800

- Very high conversion efficiency ($\geq 96\%$).
- MPPT (Maximum Power Point Tracker) of high efficiency ($> 99\%$).
- Protection degree IP65 for outdoor installation (except EQX-2800).
- Integrated LCD panel with complete information of the status.
- Natural cooling. Silent operating, no fans.
- Modern and current design.
- Compact and small outline.
- High reliability.
- Maintenance free.
- Easy installation and operation.
- High power capacity as regards to products with the same size.
- Standard RS-232, RS-485 option and others.
- ENS compliance of RD1699.
- Internal GFCI (Ground Fault Current Switch)

3.4.6. LED Control panel for EQX-5000 / 4000 / 3680 / 3450 and 2800

There is a function button and two LEDs, one green and the other one red. Usually, the green one will only be turned on during the operation.

Description:

- **Status ON (Green LED):** It lights when EQUINOX is running. The only condition to have turned it off is with grid failure, shifting to shutdown mode.
- **Fault (red LED):** Once it lights, it means that the inverter is on fault mode.

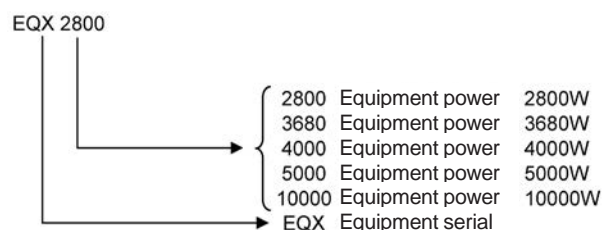


Fig. 7. View of LED control panel

3.5. Definition and structure

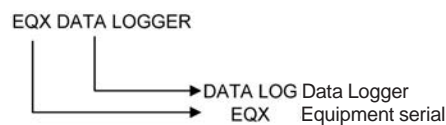
3.5.1. Nomenclature

Serie EQUINOX



3.6. Options

Opcionales serie EQUINOX



4. Installation

It is compulsory to meet all the national and international regulations, in particular the IEC 60364 and IEC 60463 part 7-712.

4.1. Important safety instructions



Risk of electrocution: This equipment has alternating current (AC) and direct current (DC) terminals. To prevent risk of electrocution during maintenance or installation tasks, make sure that all AC and DC terminals are disconnected. Check earth terminals and do not swap line or neutral cables with the earth one.



Photovoltaic inverter use: Qualified staff can only handle it. When photovoltaic panels are exposed to enough solar radiation and they are connected to the device, it is generated a DC voltage to charge the capacitors.

Once the inverter is disconnected from grid and panels, the electrical charge can still be present in the internal DC capacitors. Wait for 1 hour as minimum before handling the equipment.

For user: Photovoltaic inverter has been designed to be connected to AC grid directly. Do not connect at the AC output of the equipment any load that it were not the own AC grid.



Hot surfaces: Although it has been designed to meet the international standards, the photovoltaic inverter can be heated up during its operating. Do not touch the heatsink or case meanwhile it is in operation or in a short while after its disconnection.

Maintenance and service: Authorised staff can only open the inverter for its maintenance.



WARNING - Risk of electrocution due to energy storage in the capacitors. Do not remove the protecting cover after 8 minutes of its disconnection from all energy sources.

4.2. Reception of the equipment

4.2.1. Unpacking and contents checking

Once the equipment is received, check that its packaging contents the following parts:

- EQUINOX inverter x 1.
- User's and installation manual x 1.
- Assembling bolts, safety and cable glands.
- Assembling support for inverter x 1
- Assembling plate for control panel x 1 and Bolts to assemble the control panel x 2 (EQX-10000).



To avoid damages and for safety, use lifting systems when unpacking and installing the equipment.

4.3. EQUINOX assembling

4.3.1. Advices before assembling

To obtain the best results of this photovoltaic inverter, consider the following advices before installing the equipment:

- Do not expose the inverter to direct sunlight. Direct sunlight can increase its internal temperature and reduce its conversion efficiency.
- Check that ambient temperature is inside the stated range from -20 to +55°C.
- Grid voltage is 3 x 400 V, -15%, +10%, 50 Hz, for three phase equipments and from 196 and 253 V, 50/60 Hz for single phase ones.
- Electrical company has to approve the grid connection.
- Qualified staff has to make the installation.
- Suitable space has to be reserved around the inverter for its correct cooling.
- Inverter has to be installed far from explosive vapours.
- None inflammable substance has to be near the inverter.
- Do not make the assembling over inflammable wood surfaces.
- Temperature where inverter has to be installed and in operation has to be below 55°C. Nevertheless, for an optimal operation, it is recommended to be between 0 and 40°C.

4.3.2. Wall-mounting assembling

To fix the inverter to the wall, follow the following steps:

1. It is advisable to choose a dry location, without direct sunlight and temperatures between 0 and 40°C.
2. Choose a wall or vertical surface, which is solid enough to support the inverter.
3. Inverter needs a suitable cooling space. Reserve 50 cm. as minimum over and under the inverter. In case, more than one inverter were installed, leave a space of 30 cm. among them, as minimum.

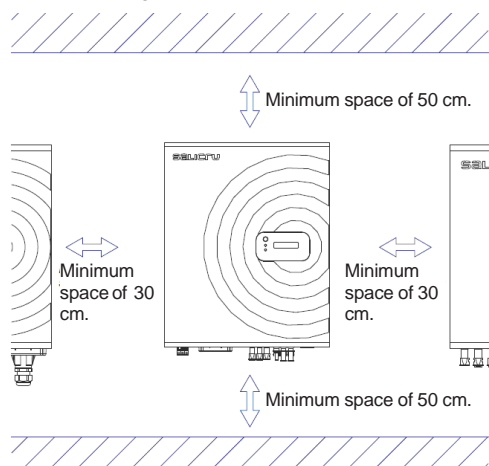


Fig. 8. View of recommended cooling spaces

4.3.2.1. EQX-2800 / 3680 / 3450 / 4000

1. Fix support through its assembling holes:
 - a. To install the inverter in the wall, mark the 4 orifices in the rear side of the support.

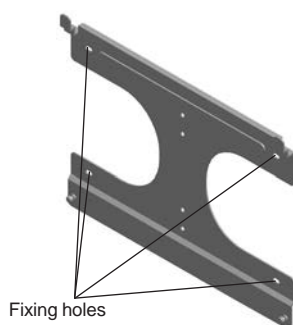


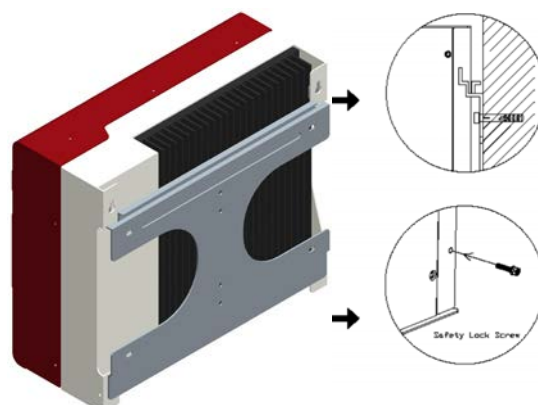
Fig. 9. Assembling support

- b. Drill the 4 holes in the wall and insert 4 rawplugs. Insert the 4 screws and tighten them.

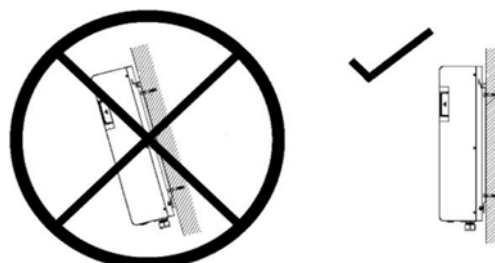
- c. Next figure shows the assembling using the assembling orifices of the support.



2. Fix support through the assembling orifices:
 - a. To install the equipment properly, mark the 4 central orifices in the rear side of the support.
 - b. Drill the 4 holes marked in the wall, enter the raw-plugs and tighten.
3. Put the inverter over the support as it is shown:

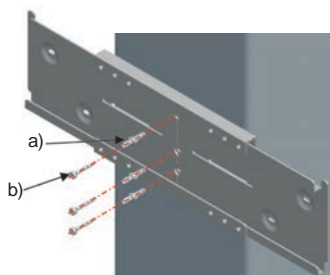


4. Insert the safety screws to fix the inverter.
5. Check that the equipment is levelled and fixed to the support properly.

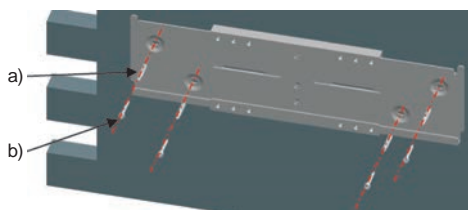


4.3.2.2. EQX-10000 / 5000

1. Fix the support through the assembling orifices:
 - a. Drill 3 or 4 holes in the wall to insert the rawplugs (a), screws M4*30 (b) and hang up the support.
 - For model **EQX-5000**:

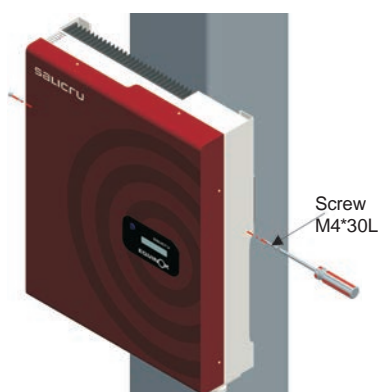


- For model **EQX-10000**:



2. Fix

the inverter to the wall-mounting support:

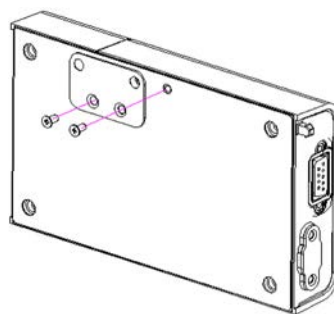


Check that inverter is well fixed by pulling from it vertically.

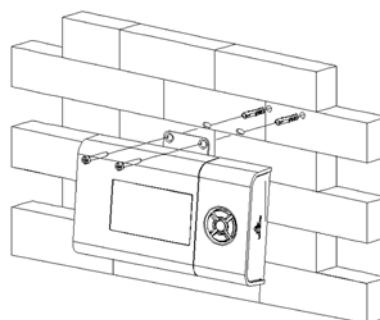
Choose the correct installation location in order to read the LCD panel easily.

3. For **EQX-10000**, end-user can install the control panel separate from main unit. Its support and two screws have to be among the accessories.

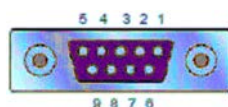
- a. Fix the support of control panel through the two screws.



- b. Drill two orifices in the wall, insert the screws, tighten them and fix the Control Panel in its location.



4.4. Communication Interface



TxD: Data transmission.
RxD: Data reception.
N.C.: Not connected.

Pin	Signal assignment
1	N.C.
2	TxD
3	RxD
4	N.C.
5	Common
6	N.C.
7	N.C.
8	N.C.
9	N.C.

4.4.1. RS-232

Inverter is equipped with a versatile communication interface. Use “Pro Control or EZ Control” software to monitor the status of multiple inverters. Firmware updating can also be done through this interface.

EQUINOX is equipped with a DB9 connector for RS-232 interface. Open the cover of DB9 before using it.

Pin-out is stated as follows:



WARNING: In case the communication slot option was used, the RS-232 can't be used at the same time.

4.4.2. Communication slot for RS-485 option

Inverter has a slot for a communication interface option. By adding a RS-485 card, it is possible to extend the communication functions of the equipment. To use this slot, first unscrew the cover, insert the card into the slot and connect the cable through the cable gland.



4.4.3. USB (in control panel) for model EQX-10000

Control panel is supplied with a mini USB connector for USB interface of PC. Open the cover of this mini USB before using it.

4.5. Connection

4.5.1. From AC-Junction box

The AC-Junction box is an interface between the inverter and AC grid. It can be based on a circuit breaker, fuse and terminals to connect both the inverter and AC grid. This interface has to be designed by a qualified technician to meet the local safety regulations.

4.5.2. Connection to AC grid

1. Measure the voltage and frequency of AC grid. It should be 230 Vac (or 220 Vac) and 50 Hz single phase.
2. Turn off the circuit breaker or fuse placed between the Inverter and grid.
3. Use the correct cable cross section (in accordance with IEC 60364-4-43 and the national installation regulations).

MINIMUM RECOMMENDED CROSS CABLE SECTIONS:

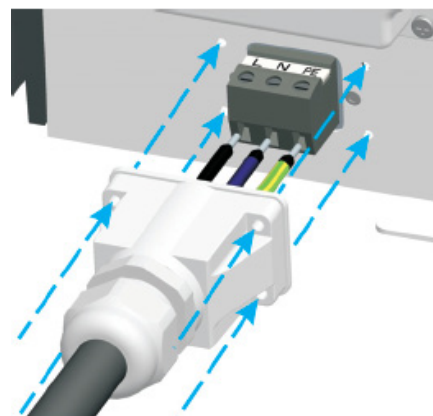


Fig. 10. Diagram of AC output connection

Model	AC Power	Cross cable section		Length of peeling cable off
		Braided cable	Solid cable	
	W	mm ²		mm
EQX-10000	10000	6 ~ 8	6 ~ 8	10
EQX-5000	5000	6 ~ 8	6 ~ 8	10
EQX-4000	4000	4	4 ~ 6	10
EQX-3680	3680	4	4 ~ 6	10
EQX-3450	3450	4	4 ~ 6	10
EQX-2800	2800	2 ~ 4	2 ~ 4	10

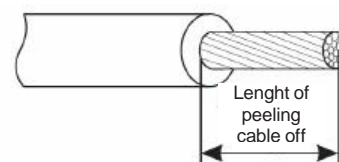


Tabla 1. Cross cable section per model

- See table 1.
- Insert the AC cable from grid through the cable gland. Connect the cables depending on the polarity stated in the terminal strip.
L → Line (brown, black, white, blue, grey are usually used for neutral N (in accordance with NEC).
N → Neutral (blue).
PE → Protected earth (green-yellow).
- Fix the cable gland with the supplied screws.
- Turn the cable gland till the cable is fasten firmly.
- It is recommended an earth leakage breaker RCD A of 30 mA or 100 mA as additional protection in accordance with IEC 60364-4-41 clause 412.5.

4.5.3. Connection to photovoltaic panel (DC input)

1. Make sure that the maximum open circuit voltage (Voc) of each photovoltaic panel is lower than the one stated in the following table:

Model	Voc	Maximum current
	Vdc	Idc
EQX-10000	≤ 800	39
EQX-5000	≤ 550	23,2
EQX-4000	≤ 500	20
EQX-3680	≤ 500	20
EQX-3450	≤ 500	20
EQX-2800	≤ 450	13

Tabla 2. Maximum open circuit voltages and currents per model

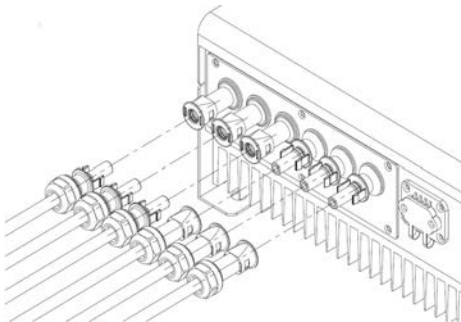


Fig. 11. Connection with photovoltaic panels

2. Use MC3, MC4 connectors or compatible for DC wiring (ex.: Wieland PST40II).
3. Connect the positive end of photovoltaic panel to (+) terminal and the negative end to (–) terminal. Each DC terminal has a maximum size according to table 2.



Protect the non-used DC connectors of photovoltaic inverter with a cover.



Before turning on the voltage to the photovoltaic inverter, check that polarity is correct, otherwise it could damage the inverter irreversibly.



Check the short-circuit current, ISC, of connected photovoltaic panel.



Inverter is exposed to high voltages inside when photovoltaic panel is exposed to sun, which can cause electrocutions to direct contact with alive parts. Handle always with care the photovoltaic panels and connectors. Install protections against direct contacts.

4.5.3.1. Particular case of EQX-10000

To connect the DC input, all connected panels must be of same type. Quantity, orientation and inclination of panels can be different depending on the application. Connector specification is as follows:

Type of connector	Size of connection cable	Maximum current
Female panel 	Connection system of Ø 3mm	20 A
Male panel 	Connection system of Ø 3mm	20 A

ADVICE BEFORE CONNECTING THE PHOTOVOLTAIC PANELS

To obtain the best results of photovoltaic inverter, consider the following rules:

1. Check the maximum open circuit voltage of each panel set, under any condition, is lower than 800 Vdc.
2. Connect (+) terminal of each panel to DC (+) terminal of inverter, and (–) terminal of each panel to DC (–) terminal of inverter.
3. Each MPPT DC terminal of the inverter converts 13 A DC as maximum, so 3 pair of DC terminals can convert a maximum combined of 39 A.
4. To optimise the photovoltaic generation, follow the following recommendations:
 - a. For outputs lower than 13 A, use one DC terminal strip of the inverter.
 - b. For outputs between 13 A and 26 A, use two DC terminal strips of the inverter.
 - c. For outputs between 26 A and 39 A, use three DC terminal strips of the inverter.

Next figures show the photovoltaic system:

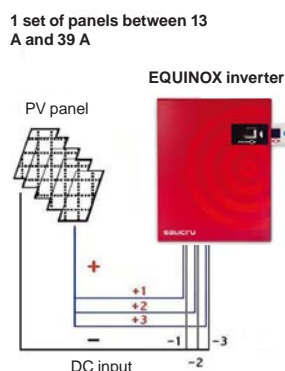


Fig. 12. Photovoltaic system with 1 set of panels

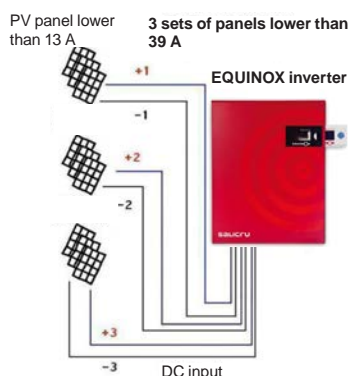


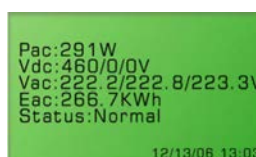
Fig. 13. Photovoltaic system with 3 set of panels

Once the photovoltaic panels are connected to the inverter, the output voltage is higher than 300 VDC. Before connecting it to grid, control panel shows the following screen:



Check the connection between the photovoltaic inverter and AC connection system and between the AC grid and AC-Junction box interface. Turn off the circuit breaker or fuse of the unit.

In normal operating, control panel shows the following screen, for example:



When LCD panel is green, it means that inverter is re-injecting power to grid. Therefore the installation has been done successfully.



Before connecting the photovoltaic panels to DC terminals, check the polarity of all connections. Wrong connection can damage the equipment.

CHECKING THE INSTALLATION



There are high voltages in the terminals of photovoltaic panels once they are exposed to sunlight. Risk of electrocution. Avoid any direct contact with these parts of the equipment.

4.6. Testing and commissioning after the installation

1. Follow the messages displayed in the LCD panel. They are:
 - Power ON LED (green).
 - Fault LED (red).

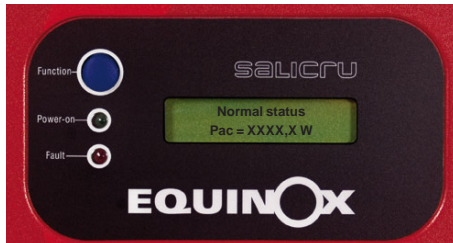


Fig. 14. LCD panel

When photovoltaic panel is connected and its input voltage is higher than the initial feeding voltage and the AC grid is not connected yet, the LCD panel will display the message: "Standby" → "XXXX W" → "Waiting" → "No AC grid". In this status the message "No AC grid" will remain and the fault LED will light.

Next, it is shown the sequence of the screens:

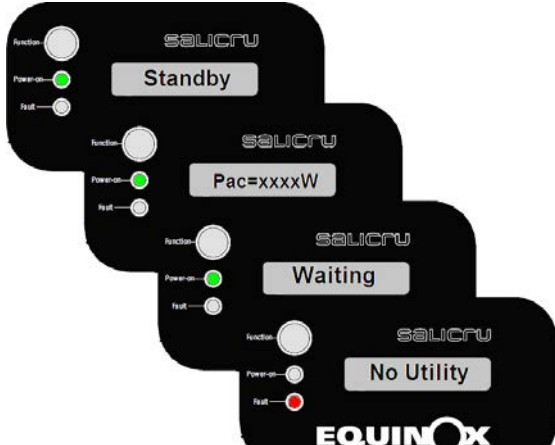


Fig. 15. Sequence of messages in the LCD panel with no AC grid

2. Turn on the AC circuit breaker or fuse between the photovoltaic inverter and AC grid. The inverter status has to change to normal running after a countdown "Checking xxS" if photovoltaic panels are supplied with a DC voltage higher than the initial feeding voltage.

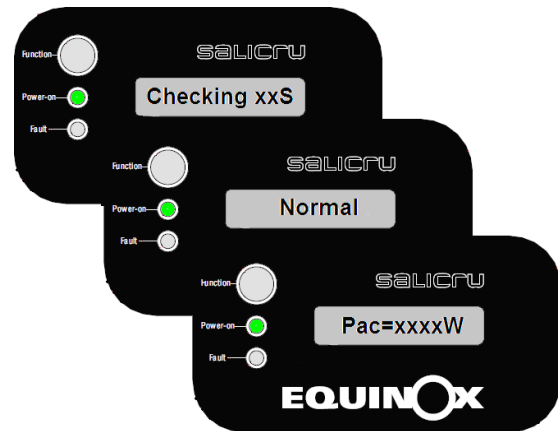


Fig. 16. Sequence of messages in the LCD panel when AC grid is present

5. Operating

5.1. Operating modes

5.1.1. EQX-10000

Inverter starts automatically once both DC voltage from photovoltaic panels is enough and fuse is fitted in.

There are four operating modes. There is a corresponding colour and indicative status text per each mode.

1. **Normal:** On this mode, the inverter converts the solar energy to injectable power to AC grid continuously. Its corresponding colour is green.



2. **Fault restoring:** In some situations, like wrong voltage and frequency, the inverter is disconnected from AC grid. Once the normal situation is restored, the inverter recovers its normal operating. During the next 48 hours, the colour of the LCD panel will be yellow as the graphic shows. Once this time is passed, if there is not any other fault situation, the background colour will come back to green again.



3. **During the fault:** During grid or system fault (see table of error messages for more information), the inverter is disconnected from AC grid, the colour of the LCD panel changes to red and it is activated a notification alarm for the user, who can press the button "OK" from keypad to clear it. To check the message. If notification fault can't be cleared, contact with the Technical Service.



4. **Shutdown:** At night and cloudy days, the inverter is shutdown automatically. In these conditions, the control panel and keypad remain inactive.

5. Three operating statuses:

- a. **Standby:** During normal operating, the inverter is on "Standby" status for voltages of open circuit between 200 V and 300 V.



- b. **Waiting:** Between 300V and 350 V at DC side, the equipment is on waiting mode. Meanwhile, the inverter checks the DC and AC conditions and waits to be connected.



- c. **Normal:** In this status, DC voltage has to be over 350V. To check the DC wiring, the inverter tries to disturb its input in each start up. During this process, the user can notice the flow of DC measurement.



5.1.2. EQX-5000 / 4000 / 3680 / 3450 / 2800

There are 3 operating modes:

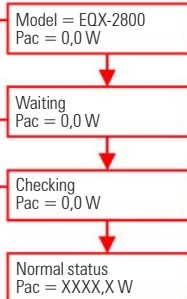
1. **Normal:** In this mode, the inverter works normally. Whenever the energy supplied by the panels is enough (voltage > "Initial Feeding Voltage"), it converts and re-injects the energy to the grid. But if the energy is not enough, the inverter enters on "Waiting" or standby mode, meanwhile the device uses the minimum power to monitor its internal system. On this mode the green LED is ON.
2. **Fault:** The intelligent inverter controller monitors the status of the system continuously and adjust the status of the system. If unexpected conditions are being detected like problems in grid or internal faults, they will be displayed in the LCD panel, being the fault LED turned on.
3. **Shutdown:** During the periods with lack of sunlight, the inverter is shutdown automatically. In this mode the inverter doesn't take any power from mains. The LCD panel and LED from front panel are turned off.

Also, there are **three operating status** : **Standby, Waiting, Normal**: during normal operating, the inverter goes to standby status with voltages lower than the “Initial Feeding Voltage” and starts to check its own internal status. The following example shows the LCD panel of EQX-2800 model when panels input is increased over 100V:



When panels supply a high voltage than 100 V, the inverter goes to waiting mode.

When panels supply a voltage higher than 150 V, the inverter starts a countdown from 20 to 0 checking its internal status and going to normal mode.



Before connecting the panels to DC terminals, check the polarity of each connection is correct, otherwise it could damage the equipment permanently.

5.2. Control panel

5.2.1. EQX-10000

5.2.1.1. Operating

1. **Keypad**: In the control panel there are 5 keys to select and operate. Next the function of each one is defined:
 - “→”: View of the lower layer (1st to 2nd) or move the cursor to the right.
 - “←”: View of upper layer (2nd to 1st) or move the cursor to the left.
 - “↑”: View of previous screen or move the cursor up.
 - “↓”: View of next screen or move the cursor down.
 - “OK”: Select or validation.
2. **Backlight LCD**: As it has been described in the previous section, the backlight colour changes depending on its operating status. To save energy, the backlight remains turned on for 3 minutes after last operation. Nevertheless, in case of fault or error, as well as to change to red, it blinks every second till the end-user press the corresponding key to the instruction in the LCD panel.
3. **Acoustic alarm**: To inform the user, control panel emits an acoustic alarm in the following cases:
 - a. Inverter fault.
 - b. Memory capacity of control panel lower than 5%.
 - c. One of the fans doesn't turn due to any reason.

This alarm can be silenced by selecting the option in “System Display”. Go to the corresponding section.

4. **Behaviour when memory is full**: When memory capacity is lower than 5%, the control panel will emit an acoustic alarm. In this moment, the user has to save the internal data and try to download the memory into a PC. In case the user ignores this warning and memory is not cleared, once it is completely full, the last data will overwrite the first one.

5.2.1.2. LCD panel. Description of the screens

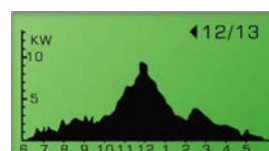
1. **Start**: Once the inverter is started up, the LCD panel shows the logo and firmware version. The screen remains visible for 3 seconds and changes to show the next information.
2. **Text of LCD panel**: LCD panel shows 4 measurements and 1 status. The button on the right side shows the time and date. When facing a warning or error message, button “Status” changes to error message automatically.

The end-user can change the four monitoring parameters.

- a. Press “→” to highlight the monitoring parameter of first row. Use “↑” and “↓”, the end-user can move to the other row.
- b. Press “OK” to set the monitoring parameters.
- c. Press “↑” or “↓” to select the monitoring parameter of the row.
- d. Press “OK” to confirm.

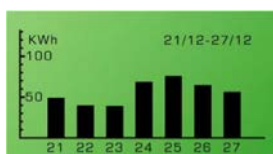


3. **Daily graphic**: Press key “↓” in the LCD panel, the screen changes to the daily graphic. This graphic shows the AC power tendency of a particular date.
 - **Time axis (x axis)**: In the picture, the longest period is 12 hours. Unit is hour. First logged data of any day is shown at the left side of the graphic. In case the logged data in one day are more than 12 hours, first press “OK” and use keys “←” and “→” to move the graphic to the desired moment. Press “OK” again to stop moving.
 - **Power axis (y axis)**: From 0 to 12kW. Each point means the average power of the last 6 minutes.
 - **Date**: Data of the present LCD panel are shown on the right top corner. To see the daily graphic of a desired day, press “→” and “←” to select it.



4. **Weekly graphic:** Press “↓” in the daily graphic, The LCD panel will changes to weekly graphic as it is shown.

- **Time axis:** 7 days from Sunday. The point on the left is Sunday.
- **Generated kWh (y axis):** It is the kWh accumulated in that day. From 0 to 100kWh.
- **Change of week:** Press “←” and “→” to change to desired week. Corresponding data on the right top corner can also be changed.



5. **Data logger of errors:** Press “↓” again at weekly display, the LCD panel changes to “Error message” as it is shows next. The LCD panel shows two logged error events per each page. To check more error events, first press “OK” and “↓” and after “↑”.

E1:Isolation fault
@ 25/12/06 13:24
Value=N/A
E2:Grid fault
@ 20/03/06 07:06
Value=51.5Hz

6. **System Display:** Press “↓” again at “Error data logger”, the LCD panel changes to inverter information, including firmware, etc. as it is shown next.

Monitoring parameters displayed at “System Display” are the following:

System Display
SN:SV10000-01
Version:00.21-00.04
Memory:1.7%
Date:12/13/06 Wed
Time:16:15:05 GMT+08
Audible Alarm:On

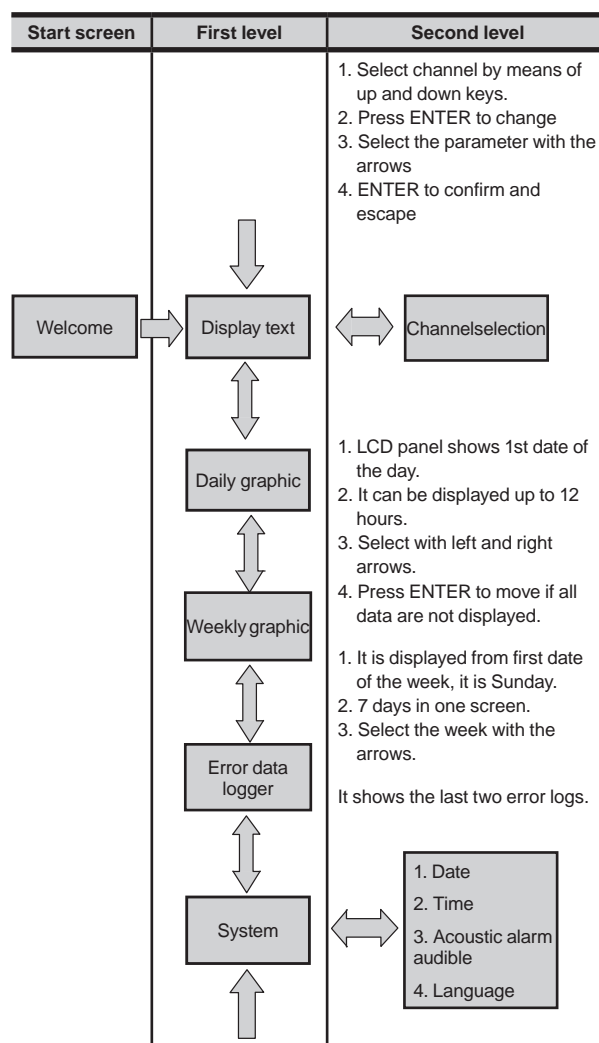
- **SN:** Inverter serial number.
- **Version:** Inverter firmware version.
- **Memory:** Status of the memory of control panel.
- **Date:** Date set in the inverter.
- **Time:** Time set in the inverter.
- **Acoustic alarm:** “On” or “Off”, status of the setting.
- **Language:** Language set in the LCD panel.

To set date, time, acoustic alarm and language:

- Press “→” and “↑” or “↓” to change the desired parameter setting.
- Press “OK” to validate. Use “↑” and “↓” to modify the value.
- Press “OK” to validate.

5.2.1.3. Tree of functions.

The following table summarize the operating:



5.2.1.4. Downloading data at the control panel

To manage the data at the control panel, remove it from the inverter and access to its internal data by means of the USB cable. Control panel will be fed from USB port of PC directly.

TO LOCK/UNLOCK THE CONTROL PANEL.

- To unlock it, press the part marked as “PUSH LOCK/UNLOCK”.



- Once it is removed, the connection cable of 1,8 metres between the control panel and the inverter comes out. For longer lengths a standard RS-232 cable can be used.



- To put the control panel back, first fix the cable with a bridle and slide the control panel towards the inverter, by pressing a little bit till hear its locking.

HOW TO ACCESS AND MANAGE THE DATA.

- Remove control panel from the inverter and disconnect the RS-232 cable. Unscrew and remove the cover of mini-B USB port. For a PC with Windows ME, 2000, and XP, platforms it is not needed to install a driver to access to the data. For PC with Windows 98 platform, it is needed a driver to have access to the data.



Do not remove the control panel meanwhile the inverter is running.

- Connect the mini USB-B to control panel and typewrite A USB in PC. LED will show "USB CONNECT".



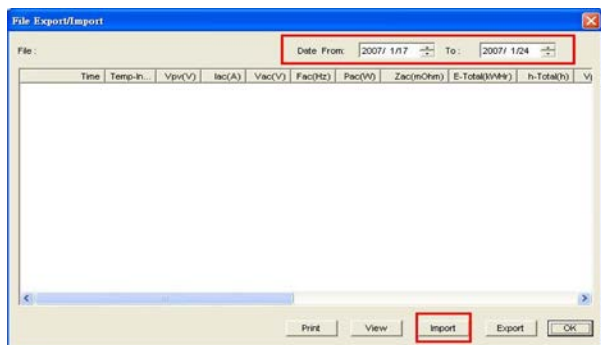
- Click "My Computer" - "External disk".
- Copy the folder "DAILY" in the "External disk" and paste it in the desk.
- Execute the application Pro-Control. Click on "File", select "Export/Import".



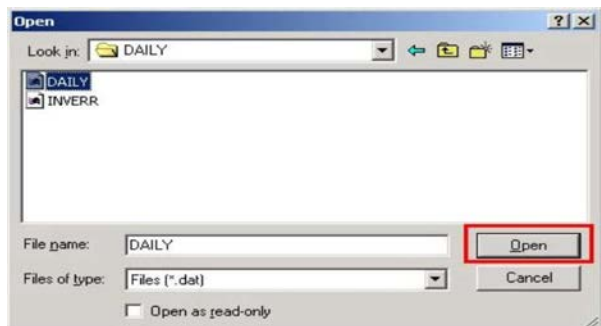
Contact with Technical Service to install this application.



- Select the desired period with "Date from" and "Date to". Later on click on button "Import".



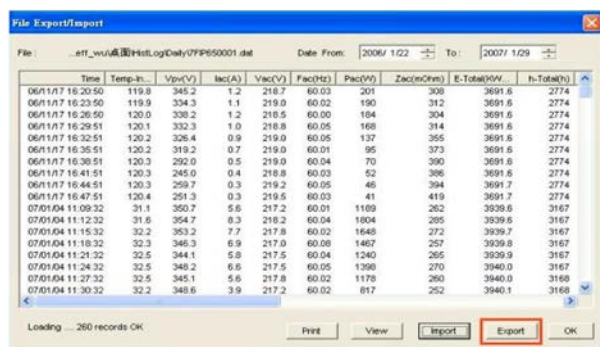
- Select the file "DAILY.dat" from previously saved folder DAILY. Click on button "Open".



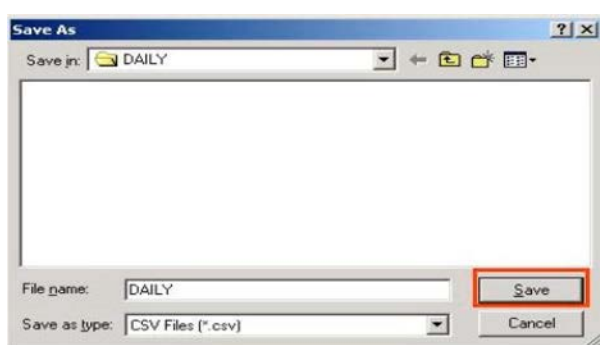
- Click on button "View". Data will be processed by the Pro-Control application in a few seconds.



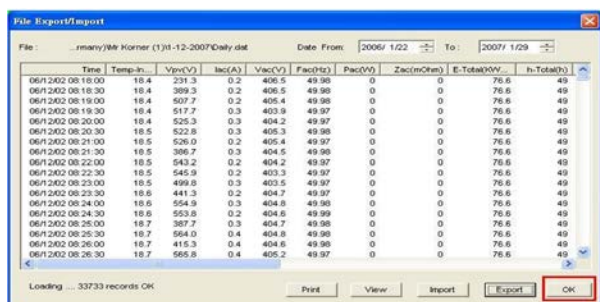
9. Click on button "Export".



10. Click on button "Save". Data will be saved in .CSV format.



11. Click on button "OK".



12. Double click on file "DAILY.CSV" to manipulate the data with microsoft Excel.

5.2.2. EQX-5000 / 4000 / 3680 / 3450 / 2800

The inverter operating is very easy. During is normal operating, the inverter works automatically. Nevertheless, to reach the maximum conversion efficiency :

1. **Automatic On-Off:** The inverter automatically starts when DC power from photovoltaic panels is enough. Possible status:

- ☐ **Standby:** Panel set can only supply the needed voltage to feed the minimum requirements by the controller.
- ☐ **Waiting:** When DC voltage from panels is higher than 130V, the inverter goes into wait status and tries to be connected to the grid.
- ☐ **Normal operating:** When DC voltage from panels is higher than "Initial Feeding Voltage", the inverter is on normal status, supplying the grid. It will automatically be shutdown when power is not enough.

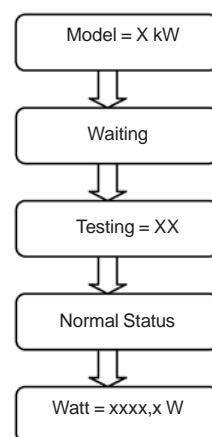
2. **Start sequence:** When panel voltage is enough, the inverter displays the information showed in the next graphic.

Fig. 17. Information during the start up

3. Changing the displayed information: During normal operation, LCD panel is automatically set to display the power supplied to AC grid. Press function button and release it immediately to see additional information. Each pulsation changes the displayed information.

4. Keeping the LCD panel: If it were needed to freeze a determined screen, press function key repeatedly till the desired screen is displayed. Release the key and press it again for more than 1 second till watching "Lock". To change it again, press the key as it

has been stated in step 3.

5. **Control of LCD panel backlight:** To save power, the backlight is turned off after 30 seconds. To turn it on again, press Function key again.6. **Control of contrast:** A natural phenomena of LCD panels is that they get dark when temperatures are high. To see the contrast, proceed as follows:

- a. Press Function button repeatedly till the contrast setting is displayed.
- b. Press Function key for more than 2 seconds, till message "Contrast setting" and graphic bar on the right are displayed.
- c. Press Function key repeatedly till set the contrast properly.

- d. Release the key and after 10 seconds it will display "Watt = xxxx,x W".
- e. The setting has been done.

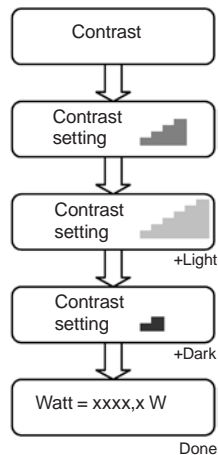


Fig. 18. Contrast setting

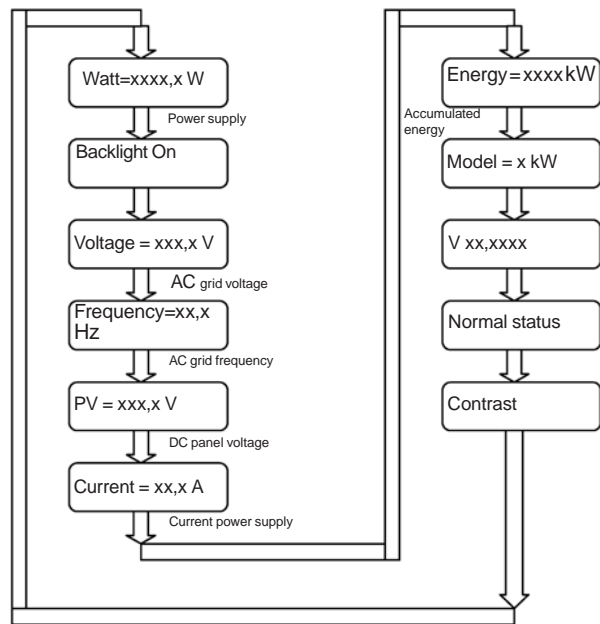


Fig. 19. LCD panel screen sequence

5.2.3. LCD panel messages

LCD panel messages can be displayed in several languages. The set language by default is Spanish.

Operating conditions	Displayed message	Description					
		EQX-10000	EQX-5000	EQX-4000	EQX-3680 ⁽¹⁾	EQX-3450 ⁽¹⁾	EQX-2800
Normal operating mode							
Shutdown	No display	Inverter is completely shutdown. Input voltage: ≤ 200V ≤ 100V ≤ 70V					
Standby	Standby	200V < input voltage ≤ 260V	100V < input voltage ≤ 150V	70V < input voltage < 120V			
Initialization and waiting	Waiting	Input voltage 260~350V during start up. Once the PV voltage is >350V, the inverter will be ready to supply the AC grid.	Input voltage 150~180V during start up. Once the PV voltage is >150V, the inverter will be ready to supply the AC grid.	Input voltage 120~150V during start up. Once the PV voltage is >120V, the inverter will be ready to supply the AC grid.			
Testing AC grid	Checking xxxs	Once the PV voltage is >350V, the inverter checks the power supply conditions.	Once the PV voltage is >180V, the inverter checks the power supply conditions	Once the PV voltage is >150V, the inverter checks the power supply conditions.			
Supplying grid, MPPT	Normal	Inverter is in operation and supplying power to AC grid. After 10 seconds, the LCD panel will display the power					
FLASH	FLASH	Firmware FLASH.					
Monitored parameters							
Instantaneous output power	Pac=xxxx,x W	Output power in real time, in xxxx,x W.					
Information of accumulated energy	Eac=xxxxxx kWh	Total energy supplied to AC mains since the inverter was installed.					
AC voltage grid	Vac=xxx.x V	AC input voltage in xxx.x Vac.					
AC frequency grid	Frecuency = xx.x Hz	Grid frequency in xx.x Hz.					
Current power supply	Iac = xx.x A	Accumualted current of grid in xx.x A.					
Panel set voltage	Vdc = xxx.x V	Input voltage coming from PV panels, xxx,x Vdc					
Daily energy	E-today = xxx.xx kWh	Daily accumulated kWh.					

Operating conditions	Displayed message	Description					
		EQX-10000	EQX-5000	EQX-4000	EQX-3680 ⁽¹⁾	EQX-3450 ⁽¹⁾	EQX-2800
System fault							
Insulation failure	Isolation fault	Earth fault of panels or failure in overvoltage protection.					
GFCI active	Ground I fault	Earth leakage current in earth cable is too high.					
AC grid fault	Grid fault	AC mains specifications are out from limits (voltage and frequency).					
No AC grid	No utility	AC grid is not available.					
Input voltage too high	PV over voltage	Input voltage is higher than the maximum input voltage					
Inverter fault							
Consistent fault	Consistent fault	Measurements of both microprocessors are not consistent. Probably there is a wrong operating of CPU and/or other circuits .					
Temperature too high	Over temperature	Internal temperature is over the normal value.					
Output relay fault	Relay failure	The existent relay between the inverter and grid doesn't work.					
DC injection at the output is too high	DC INJ High	DC injection at the output is too high.					
EEPROM problem	EEPROM failure	EEPROM has problems to access the data.					
Communication problem between μ P	SCI failure	Wrong communication between microprocessors.					
DC bus voltage too high	High DC bus	DC bus voltage is too high.					
DC bus voltage too low	Low DC bus	DC bus voltage is too low.					
Problem in the internal reference voltage 2,5 V	Ref 2.5V Fault	Reference voltage of 2,5 V is wrong.					
DC output proof damage	DC sensor fault	Wrong DC output proof.					
Problem at GFCI detection	GFCI failure	GFCI detection circuit is wrong.					
Information of the system							
Displayed model	Model	Model description					
LCD contrast setting	Set Contrast	Setting of LCD panel contrast					
LCD panel blocking	Lock	Current message is blocked					
Waiting grid re-connection	Reconnect in xxx sec	Time of grid reconnection					
Waiting for AC grid reconnection	Reconnect in xxx sec.	Time to AC grid reconnection					
Firmware version	Version: xx.xx	Information of CPU F/W version master and slave.	F/W version information				
SD memory card	Memory: xx.x%	Use of SD memory card .					
Language setting	Set Language	LCD panel language setting					
Warning messages							
Memory full	xx.x% memory left	It is displayed the message warning when the memory capacity of the card is lower than 5%.					
Fan blocked	FanLock	Fan has suddenly been stopped.					

(1) Portuguese market only

5.2.4. Measurement accuracy

LCD panel measurement has to be considered as a mere reference. We do not recommend to use the data for testing or checking the system. Usually, its accuracy is about $\pm 2\%$. In all operating ranges the accuracy can reach up to $\pm 5\%$.

5.3. Maximum Power Point Tracker (MPPT)

Thanks to its advanced design, the inverter can track the maximum power of any photovoltaic panel under any condition. When output power is stable, the inverter converts its maximum available power. Otherwise, it follows the power changes due to the solar light level fluctuations.

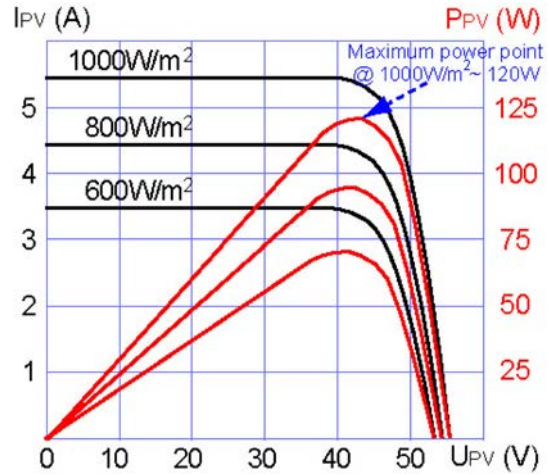


Fig. 20. Graphic of the PV panel output



If DC voltage from output panel is low, the AC power can flow slowly. This is normal, because the inverter makes tracking of DC maximum power point continuously. LCD panel shows this variation in the power.

6. Maintenance, Warranty and Service

6.1. Basic maintenance guide



WARNING! . DO NOT OPEN the covers and do not try to repair the equipment. There are dangerous voltages inside that could remain even with the equipment off. A non-authorized reparation will expire the warranty and it could cause damages.

6.1.1. Preventive maintenance

Although the photovoltaic inverter requires very low maintenance, the following inspections will help you to guarantee an optimal operating of the inverter.

6.1.1.1. Visual inspection

Check that inverter and cables are in perfect conditions. Contact with the fitter in case any defect has been observed. Do not try to repair the inverter.

6.1.1.2. Testing and maintenance

The best way to make a preventive maintenance is to ask for testing to the fitter periodically. Points to check:

1. Check if fans are dirty or dusty. Clean them if it proceeds.
2. Check that anything impedes the airflow of the heatsinks.
3. Check that there is not any corrosion, specially in the connection points.
4. Check periodically that all connections are firmly tighten.
5. Clean the outside of the unit regularly with a clean cloth to prevent the dust and dirt accumulation. Try to keep the warranty label intact.
6. To have an optimal quality performances, clean the PV panels periodically due to its tendency to accumulate dirt and dust.



Before cleaning the PV panels or the inverter, make sure that the AC grid voltage is turned off and check that the LCD panel of the inverter displays the message "No utility". Cleaning has to be restricted to the outside surface only.



To avoid risks of electrocution, AC and DC voltages have to be disconnected whenever the personnel has to touch the PV panels under any circumstance.

6.2. Trouble Shooting

Photovoltaic inverter requires a very low maintenance. In case of any problem the red LED of fault will light and the LCD panel will display the relevant information.

- Against an unexpected situation, consult the following table before warning the Technical Service, which contains a list with the most usual failure messages and actions to take.



WARNING! There are dangerous voltages in the cables of DC and AC connections. Do not touch any active part.

Display	Possible actions
Isolation fault	- Check the impedance between PV (+) and PV (-) and also that the inverter is earthed. The impedance has to be higher than 5 MΩ. - If problem persists, call to technical service.
Ground I fault	- Current in the neutral is too high. - Disconnect the PV generator input and check the AC system. - Once the cause is detected, re-connect the PV panel and check the inverter status. - If problem persists, call to technical service.
Grid fault	- Wait 30 s. if grid is restored; the inverter will start up automatically. - Check that voltage and frequency are inside the allowed range. - If problem persists, call to technical service
No utility	- Grid is not connected. - Check the wiring to grid connection. - Check the grid.
PV over voltage	- Check the open circuit voltage of the panels; check if it is higher or it is very near to 500 Vdc. - If panel voltage is less than 500 Vdc and problem persists, call to technical service.
Consistent fault	- Disconnect PV (+) or PV (-) from the input, re-start up the inverter . - If it doesn't work, call to technical service.
Over temperature	- Internal temperature is higher than the stated. - Find the way to decrease the ambient temperature, or move the inverter to colder place. - If it is not effective, call to technical service.
Relay Failure	- Disconnect all PV (+) or PV (-). - Wait a few seconds . - Once the LCD panel is shutdown, re-connect it again and check it. - If message is displayed again, call to technical service.
DC INJ High	
EEPROM Failure	
SCI Failure	
High DC Bus	
Low DC Bus	
Ref 2.5V Fault	
DC Sensor Fault	
GFCI Failure	

Table 3. Displayed messages by the LCD panel and possible actions

- If there is not any LCD, check the input PV connections. If voltage is higher than the initial feeding voltage, call to technical service.
- During the periods with low or lack sunlight, the PV inverter can be started up and shutdown continuously because the generated power is not enough to operate the control circuits.

6.3. Warranty conditions

The limited warranty by SALICRU, only applies to those products that you acquire for commercial or industrial use in the normal development of your business.

6.3.1. Covered product

EQUINOX photovoltaic inverter with grid connection.

6.3.2. Warranty terms

SALICRU, guarantees the product against any parts and/or labour defect for 5 years. Under request, it is possible to extend this warranty. In case of failure of the product inside the warranty period, **SALICRU**, must repair, at your facilities at no cost, the faulty part or parts. The transport expenses and packaging will be borne to the user.



For equipments out from the national territory, contact with the Export Department.

SALICRU, guarantees for period time higher than 10 years, the availability of parts and spare parts, as hardware as software, as well as a complete assistance regarding the reparations, components replacement and software updating.

Faulty parts or any wrong operating when doing the installation it has to be communicated, in writing, inside the next 5 working days after receiving the goods.

6.3.3. Out of scope of supply

SALICRU, is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of repairing or not authorized modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

6.4. Description of available maintenance and service contracts

When the warranty is expired, **SALICRU**, adapting to the customer's needs, has several maintenance modalities:

- **Preventive.** It guarantees a higher safety to preserve the correct operating of the equipments with a yearly Preventive visit, in which the specialised technicians from **SALICRU**, make several tests and sets in the systems:
 - ☐ Check and write down the input and output voltages and currents per phase.
 - ☐ Check the logged alarms.
 - ☐ Check the readings of the LCD panel.
 - ☐ Other measurements.
 - ☐ Check the status of the fans.
 - ☐ Check the load level.
 - ☐ Check the selected language.
 - ☐ Check the correct location of the equipment.
 - ☐ General cleaning of the equipment.

This way, it is guaranteed the perfect operating and the possible coming faults are avoided.

These supervisions are usually done without shutdown the equipment. In those cases that a shutdown were needed, date and time would agree with the customer to do the task.

This maintenance modality covers, inside the working timetable, all the journey expenses and manpower.

- **Corrective.** When a fault occurs in the equipment operating, and previous notice to our Service and Technical Support (**S.T.S.**) in which a specialized technician will establish the failure scope and he will determine a first diagnostic, the corrective action starts.

The needed visits for its correct resolution are unlimited and they are included inside the maintenance modalities. It means that in case of failure **SALICRU** will check the equipments as many time as it were needed.

Besides, inside these two modalities, is possible to fix the **action timetable and response times** in order to be adapted to the customer's needs:

- ☐ **LV8HLS.** Customer's attention from Monday to Friday from 9 h. to 18 h. The response time is inside the same day or, as maximum, in the next 24 hours of the fault notification.
- ☐ **LS14HLS.** Customer's attention from Monday to Saturday from 6 h. to 20 h. Response time is inside the same day or, as maximum, at first time of the next working day.
- ☐ **LD24HLS.** Customer's attention from Monday to Sunday 24 h., 365 days per year. Response time in less than two or three hours after the fault notification.

- **Additional arrangement: 1-m-cb.**

☐ **Index 1.** It means the number of **Preventive** visits per year. It includes both the journey and manpower expenses inside the established timetable for each maintenance modality, as well as all the needed **Corrective** visits. Excluding all the parts and batteries in case of reparation.

☐ **Index m.** It means to include all the spare parts.

6.5. Technical service network

Service and Technical Support (**S.T.S.**) cover, at both national and international, consists of:

At national level:

Andorra, Barcelona, Madrid, Bilbao, Gijón, A Coruña, Las Palmas de G.Canaria, Málaga, Murcia, Palma de Mallorca, San Sebastian, Santa Cruz de Tenerife, Seville, Taco (La Laguna - Tenerife), Valencia and Zaragoza.

At international level:

France, Brazil, Hungary, Portugal, Singapore, U.K., China, Mexico, Uruguay, Chile, Venezuela, Colombia, Argentina, Poland, The Philippines, Malaysia, Pakistan, Morocco, Thailand, Emirates Arabs United, Egypt, Australia and New Zealand.

7. Annexes

7.1. Technical specifications

Model	EQX-10000	EQX-5000	EQX-4000	EQX-3680 ⁽¹⁾	EQX-3450 ⁽¹⁾	EQX-2800
Input						
DC nominal voltage	640 Vdc	380 V	360 Vdc			
Maximum PV open circuit voltage	800 Vdc	550 V	500 Vdc			
Start voltage of the system		150 V typical	120 V typical			
Initial grid voltage		180 V	150 V			
Shutdown voltage		100 V	70 V typical			
Operating voltage range ⁽²⁾	200 ~ 800 V	130 ~ 550 V	100 ~ 500 V			
MPPT voltage range ⁽³⁾	320 ~ 720 Vdc	230 ~ 500 Vdc	250 V ~ 450 Vdc			
MPPT efficiency	> 99%					
Max DC current / tracker	13 Adc	23,2 Adc	20 Adc			13 Adc
Max DC power / tracker	5.500 W	5.336 W	5.000 W			3.250 W
Nr MPP Trackers	3	1				
DC voltage ripple	< 10%					
DC insulation resistance ⁽⁴⁾	< 5 MΩ					
Output						
Nominal AC output power	10.000 W	5.000 W	4.000 W	3.680 W	3.450 W	2.800 W
Maximum AC output power	11.000 W	5.000 W	4.400 W	3.680 W	3.450 W	3.000 W
Nominal voltage	3 x 400 V	230 V				
Operating voltage ⁽⁵⁾	+10% / -15% ⁽⁶⁾					
Nominal frequency	50 Hz					
Operating frequency ⁽⁷⁾	49,05 ~ 50,95 Hz					
Maximum AC current	18,7 A	24 A	20 A	16 A		14,3 A
Nominal AC current	14,5 A	21,7 A	17,4 A	16 A		12,2 A
AC wiring system	3 phases, 4 wires	1 phase, 2				
Harmonic distortion THDi	< 3%					
Power factor	> 0,99					
Conversion efficiency (max.)	> 96,5%	97%	> 96%			
European efficiency	> 95%					
General data						
Topology	Transformerless					
Electrical consumption standby / night	< 30 W / < 3.5 W	< 8W / < 0,1W	< 7W / < 0,1 W			
Protection degree	IP65					IP43
Operating temperature range	-20 to 55°C					
Operating temperature range for continuous output power	-20 to 40°C					
Humidity	0 al 95%, non-condensing					
Altitude	Up to 2000 m with no power derating					
Heat losses	Forced cooling, fans with variable speed	Natural cooling				
Manufacturing process	No lead, in accordance with RoHS GP2					
Acoustic noise level	< 45 dBA	< 35 dBA				

Model	EQX-10000	EQX-5000	EQX-4000	EQX-3680 ⁽¹⁾	EQX-3450 ⁽¹⁾	EQX-2800
Communications and features						
Ports	RS-232 and RS-485 (option)					
Display	128 x 64 LCD panel	2 lines, 16 characters. Changeable information by Function button				
Datalogger (option)	Data collected up to 100 inverters					
Protocol	SALICRU open and Modbus RTU (option)					
Mechanical						
D x W x H (mm.)	155 x 455 x 585	165 x 430 x 531	136 x 386 x 434			135 x 350 x 302
Weight (Kg.)	35	30,55	19,7		19	12,5
Standard						
Perturbation regulations of grid	RD1699					
Safety	DIN EN 50178 (4.98) (VDE0160) (IEC62103)					
EMC: EMS / EMI	DIN EN 61000-6-2 (2005) / DIN EN 61000-6-3 (2007)					
CE	LVD: 2006/95/EC EMC: 2004/108/EC					

(1) Portuguese market only.

(2) Range where the inverter can supply the AC grid.

(3) 100% energy reinjection.

(4) Requirement for earthed positive or negative terminal.

(5) Voltage range regulation: RD1699.

(6) $\pm 15\%$ for Portugal.

(7) Frequency range regulation: RS1699.

7.2. Graphic of load and efficiency

Ratio between input photovoltaic voltage (PV) and input power (Pmpp) is shown in the following example. Once the PV input voltage is lower than 423V, ratio between V_{PV} and power is: $P_{dc}(W) = 13 \times V_{PV}$ (under the condition: $423V > V_{PV} > 200V$)

For example: If V_{PV} is 400Vdc, the maximum converted power by the inverter in the graphic will be 5200W.

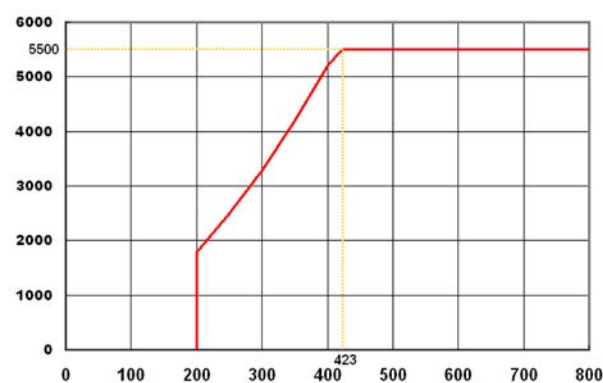


Fig. 21. Available DC power versus photovoltaic input voltage (V_{PV})

Typical efficiency graphic V_{DC} and P_{AC} is shown in the following figure.



Results can vary due to the tolerances of the tested equipments and product differences .

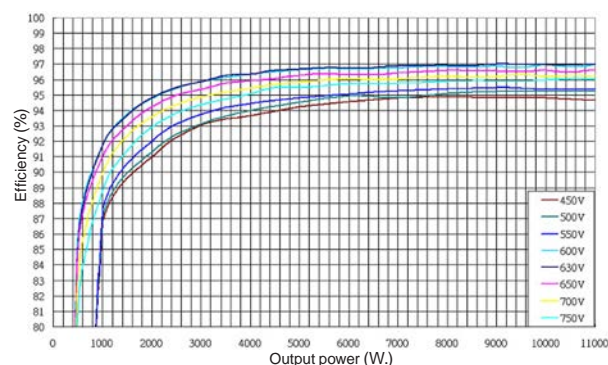


Fig. 22. Typical efficiency for EQX-10000

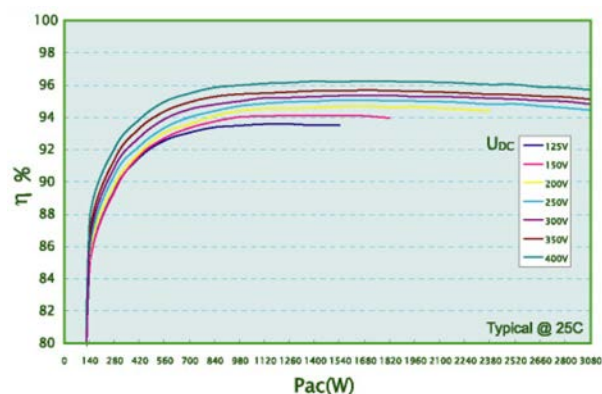
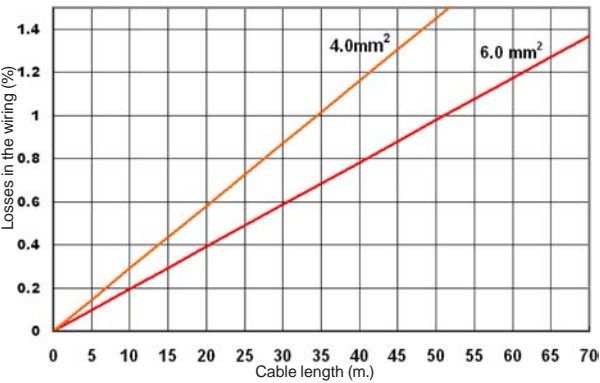


Fig. 23. Typical efficiency for EQX-2800

7.3. Losses in the wiring



Cable lengths are the following depending on the cross cable section:

Cross cable section	4.0 mm ²	6.0 mm ²
Max. wiring length	34 m	51 m

7.4. Selection of circuit breakers of grid

- Maximum nominal current for the used cable and maximum protection of the equipment fuse, limit the nominal current of the circuit breaker of grid.
- Also, check the thermal convenience of grid circuit breakers.

When selecting the grid circuit breakers, keep in mind all the load factors, which can be checked in their technical datasheets.



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Product Range

Uninterruptible Power Supply UPS
Lighting Flow Dimmer-Stabilizers
Power Supplies
Static Inverters
Photovoltaic Inverters
Microturbines
Voltage Stabilisers

